2018 – 2019 NC Math 2

Study Guides by Unit

Created by Elizabeth Matrejek and Laura Rutledge

1 Transformations

1. Triangle ABC can be seen on the graph below. Write the new coordinates for triangle ABC after the following transformations:

a.) Translate up 6 units and right 4 units
b.) Reflect in the x-axis
c.) Reflect in y = x
d.) Reflect in x = 2
e.) Rotate 270° counterclockwise
f.) Rotate 180° clockwise
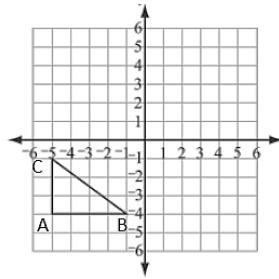
2. Describe the transformation for the pre-image to the image.

a.)
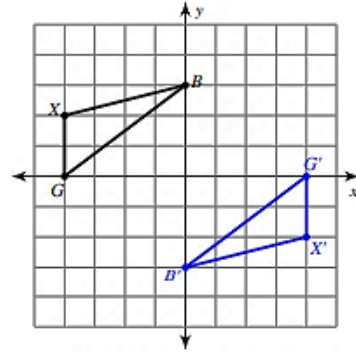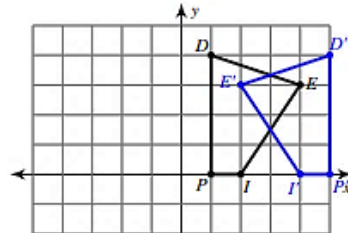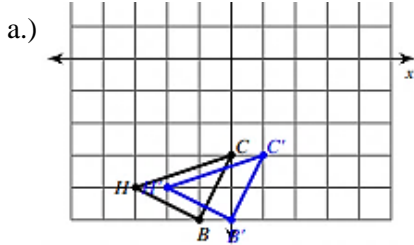
3. Triangle XYZ has the coordinates, X (4, 1), Y (5, -3), Z (-1, 0). Write the new coordinates for triangle XYZ and write the single transformation rule described by the combination of transformations, for each set below.
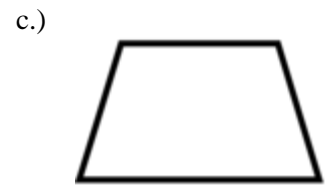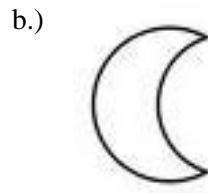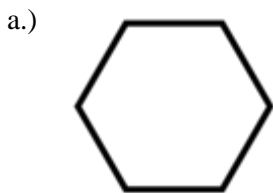
a.) rotate 90° and then dilate by a scale factor of 2
b.) reflect in y = x and then translate 5 units right and 2 units down
c.) reflect in the x-axis, rotate 180° and dilate by a scale factor of $^1/_3$

4. Describe the combination of transformations given by the single rule below.

a.) $(x, y) \rightarrow (-6x, 6y)$ b.) $(x, y) \rightarrow (2y + 3, 2x - 5)$

5. How many lines of symmetry do the following figures have?

a.)   b.)   c.)

6. List 7 rotations that would map a regular pentagon onto itself.

7. The perimeter of rectangle ABCD is 28 and the area is 45. What is the new perimeter and area after the rectangle has been dilated by a scale factor of 4?

8. The range of the transformation $f(x, y) \rightarrow (-x + 4, y - 3)$ is $\{(-3, 5), (0, 4), (2, -1)\}$, find the domain.

2 Quadratics

1. Solve by factoring $0 = 3x^2 + 15x + 12$

2. Solve by using the quadratic formula: $10x^2 - 4x = -10$

3. Solve by completing the square: $x^2 - 9x + 12 = 0$

Given the following equations, answer the questions a-j for each:

4. $y = 2x^2 - 2x - 16$

5. $y = -3(x + 2)^2 + 7$

a.) What is the axis of symmetry?
b.) What is the vertex?
c.) What are the x-intercepts?
d.) What is the y-intercept?
e.) What is the domain?
f.) What is the range?

g.) Where is the graph increasing?
h.) Where is the graph decreasing?
i.) What is the end behavior?
j.) Convert from standard to vertex form or vertex to standard form.

6. The equation $h(t) = 16t^2 + 100t + 29$ models the height of a baseball t seconds after it was hit.

a.) What is the constant and what does it represent in context of this problem?
b.) When did the ball reach its maximum height?
c.) What is the practical domain and what does it mean in context of this problem?
d.) What is the practical range and what does it mean in context of this problem?
e.) What was the height of the ball 2 seconds after it was thrown?

7. Describe the transformation of $f(x) = -3(x - 2)^2 + 3$ from the parent function.

8. You build a catapult to launch gummy bears and mark on a graph the path the gummy bear makes. The gummy bear hits the points (1, 7), (5, 20), (6, 18). What is the equation of the path?

9. What is the approximate difference in the maximum heights of the two quadratic functions below?
$f(x) = -6x^2 + 15x - 20$

x	-4	-1	3
$g(x)$	-69	15	-85

10. What are the solutions of the systems of equations below:

a) $\begin{cases} x^2 + 16x + 17 \\ 5x - 7 \end{cases}$

b) $\begin{cases} (x - 2)^2 + 1 \\ -x^2 + 5 \end{cases}$

11. Write the equation of the following graph in standard, intercept and vertex forms.

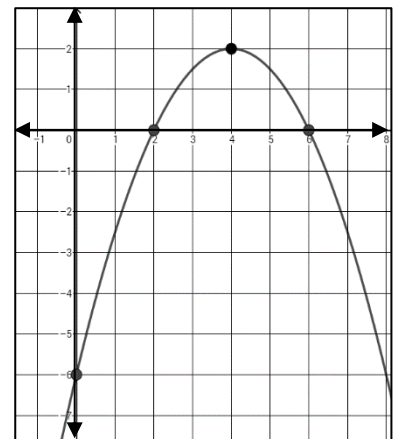Standard form:

Intercept form:

Vertex form:

12. Use the discriminant to determine the number and type of solutions.

a) $f(x) = 2x^2 - 6x + 17$

b) $f(x) = x^2 + 6x + 9$

c) $f(x) = 2x^2 + 10x + 5$

3 Radical and Rational Functions

Simplify the following.

1. $3x^4 \cdot 6x^2 y$

2. $(2xy^2 \cdot 5x^7 y)^2$

3. $(3x^{-2} y^4 z^{-5})^{-2}$

4. $\dfrac{12a^9 b^{-2} c^5}{2a^{-3} c^4}$

5. $\left(\dfrac{4r^3 p}{8rp^5}\right)^3$

6. $\left(\dfrac{15p}{3p^{-5}}\right)^{-4}$

7. i^{27}

Simplify the following and determine if they are rational or irrational.

8. $\sqrt{32} + 4\sqrt{2}$

9. $5\sqrt[3]{27} + 2\sqrt[3]{8}$

10. $\sqrt{16} - \sqrt[3]{24} + 7\sqrt{4}$

Convert the following to radical form.

11. $x^{5/3}$

12. $(x^4 y^2)^{1/3}$

13. $a^{7/2} b^{9/2}$

Convert the following to rational exponent form.

14. $\sqrt[4]{xy^3}$

15. $\left(\sqrt[3]{a^5 b}\right)^2$

16. $\sqrt[3]{a} \cdot \sqrt{b^3}$

Solve the following. Be sure to check for extraneous solutions.

17. $4\sqrt{x} + 5 = 21$

18. $\sqrt{3x+1} - 7 = -12$

19. $4 + \sqrt{-3x+10} = x$

20. Graph the following and answer the questions below: $y = -\sqrt{x+3} - 5$

a.) What is the domain?

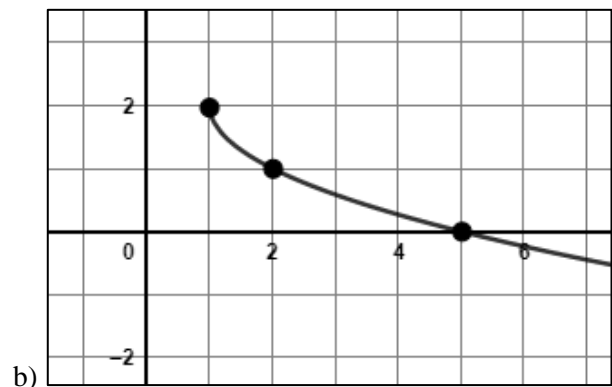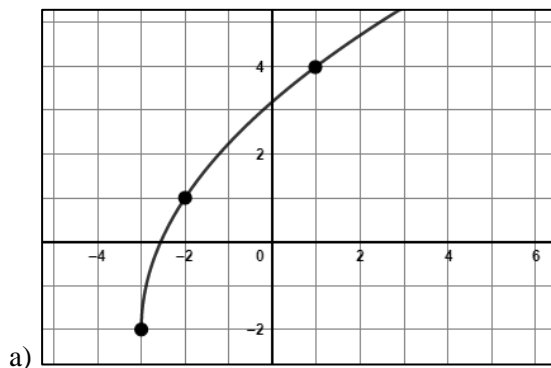b.) What is the range?

c.) Where is the graph increasing?

d.) Where is the graph decreasing?

e.) What is the end behavior of the graph?

f.) Describe the transformation for the parent function: $y = \sqrt{x}$

21. If y varies inversely with x, and y = 10 when x = 7. What is the value of y when x = 3?

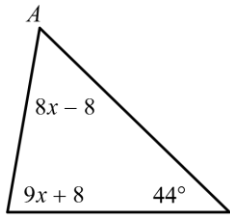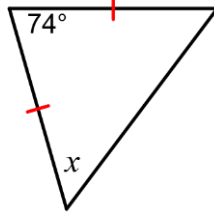22. Write the equation of the graphs below.

a)

b)

4 Congruence and Similarity

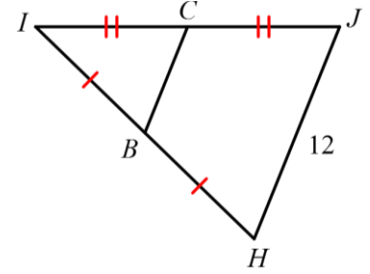Missing Measurements. Show all work. Write an equation or an explanation of your reasoning for each question.
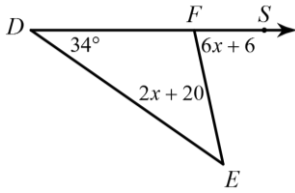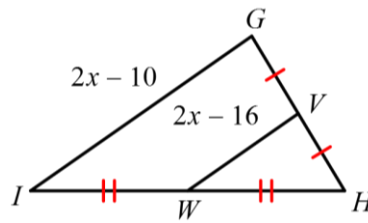
1. Find the measurement of angle A:

A

$8x - 8$

$9x + 8$ 44°

2. Find $m\angle SFE$

D   34°   F   S

$6x + 6$

$2x + 20$

E

Congruence

3. Solve for x.

74°

x

4. Find $\overline{VW}$

G

$2x - 10$

$2x - 16$ V

I   W   H

5. Find $\overline{BC}$

I   C   J

B   12

H

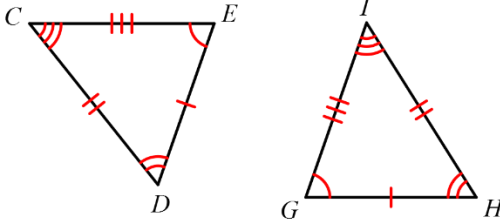6. $\overline{PR}$ bisects $m\angle SRT$. Find $m\angle 2$ if $m\angle 2 = 4x - 4$ and $m\angle TRS = 5x + 10$.

S

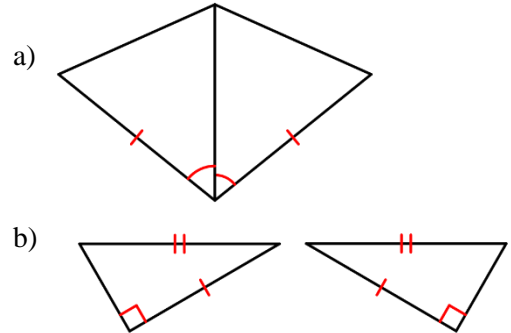P

2
1

R   T
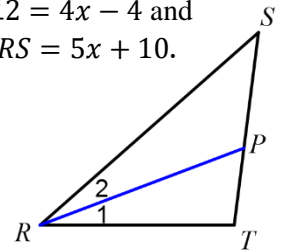
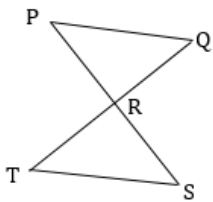7. If $\Delta EFG \cong \Delta HIJ$

$\overline{EG} \cong$?

8. Use the markings to write a triangle congruence statement.

C   E

D

I

G   H

9. State if the triangles are congruent. If they are, state how you know.
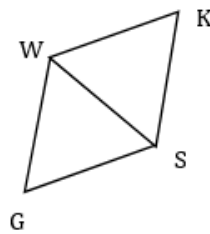
a)

b)

10. Fill in the missing information in the proof.

P

Q

R

T

S

Given:

R is the midpoint of $\overline{TQ}$
$\overline{PR} \cong \overline{SR}$

Prove that the triangles are congruent

W   K

S

G

Given:

$\overline{WK} \| \overline{SG}$
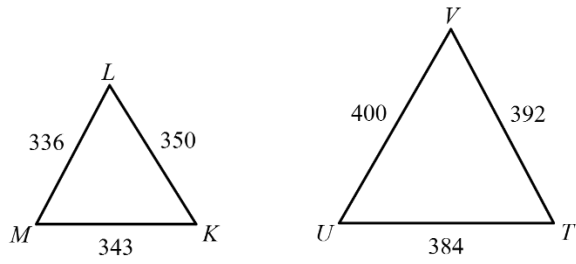
$\overline{WG} \cong \overline{SK}$

Prove that the triangles are congruent

R is the midpoint of $\overline{TQ}$	Given
$\overline{PR} \cong \overline{SR}$	Given
	Vertical Angles

$\overline{WK} \| \overline{SG}$	Given
$\overline{WG} \cong \overline{SK}$	Given
	Reflexive

Similarity
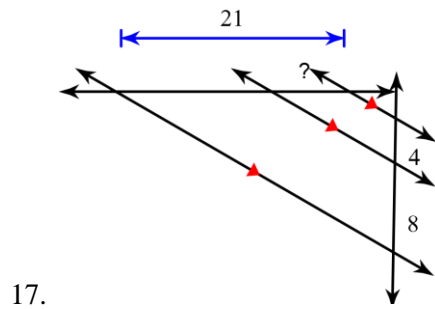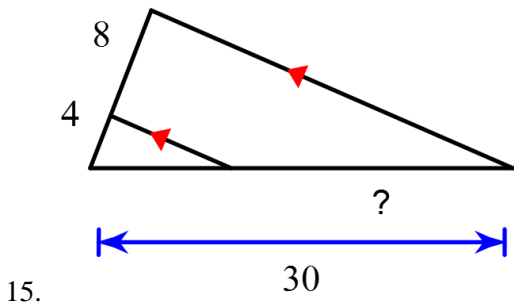   11. State if the triangles are similar.
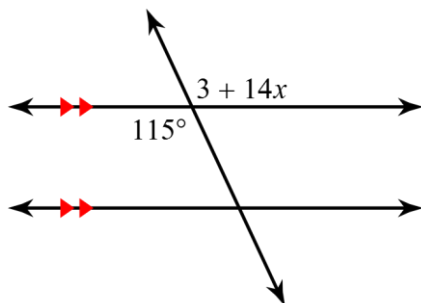   If so, state how you know they are similar.

Triangle LMK: L, sides 336 (LM), 350 (LK), base MK = 343, vertices M, K.

Triangle VUT: V, sides 400 (VU), 392 (VT), base UT = 384, vertices U, T.

Find the missing length. The triangles in each pair are similar.

   12. Triangle JKL: J, side 91 (JK), base K—? —L.

Triangle: R, J, L, Q with sides 51, 39.

   $\triangle JKL \sim \triangle JQR$

   13. Triangle with C, T, D (top = ?), T 36, 7, 28, 14, U, 42, E.
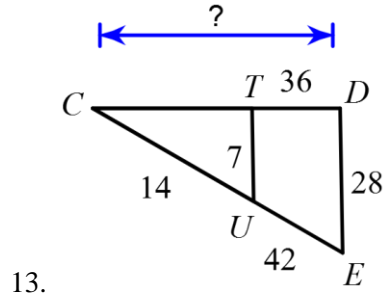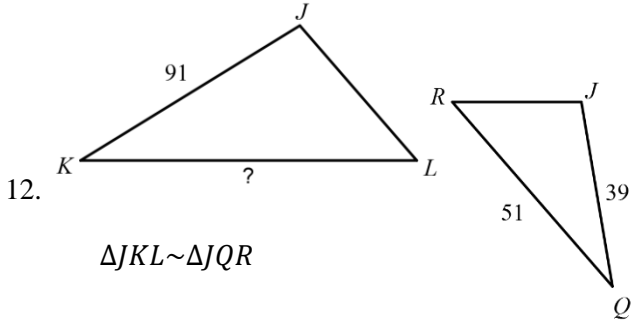
Find the missing length indicated.

   14. Triangle with x, 25 across top, 60 altitude, right angles marked.

   16. Triangle with 3, 1 on top segment, 4 on bottom, ? angle marked.

   15. Triangle with 8, 4 on left side, ? and 30 on bottom.
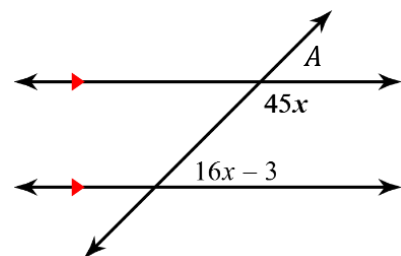
   17. Parallel lines cut: 21, ?, 4, 8.
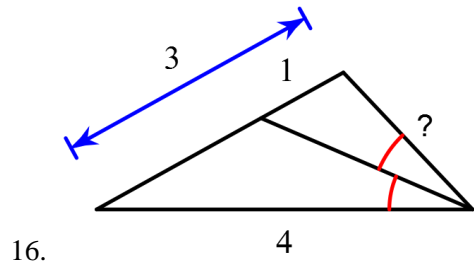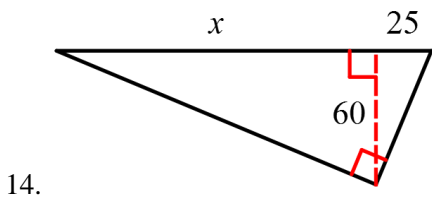
Parallel lines cut by a transversal

   18. Solve for x.

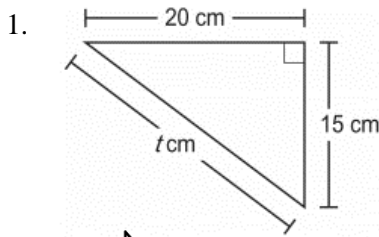Transversal with $3 + 14x$ and $115°$ crossing two parallel lines.

   19. Solve for $m\angle A$.

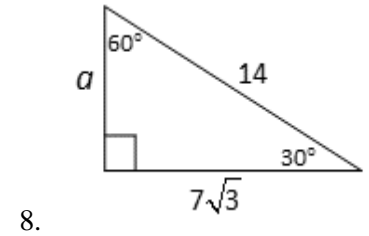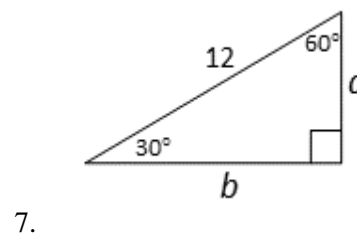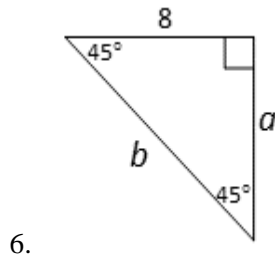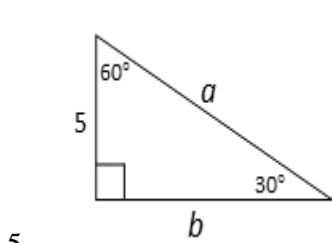Transversal crossing two parallel lines with A, $45x$, and $16x - 3$.

5 Trigonomery

Pythagorean Theorem

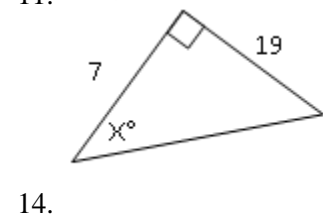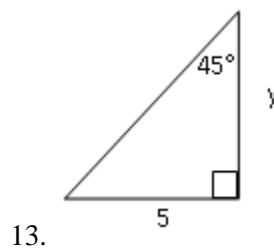Solve for the missing side. Leave answers in simplified radical form as needed.
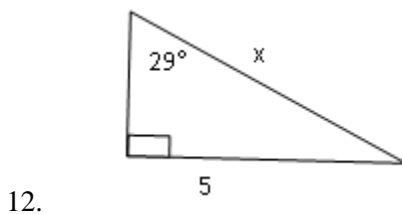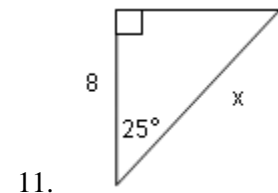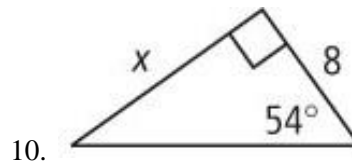
1.

2.

3.

4.
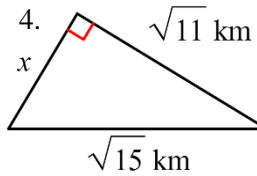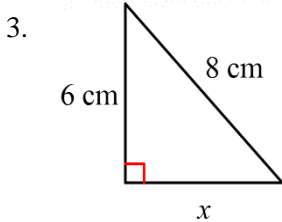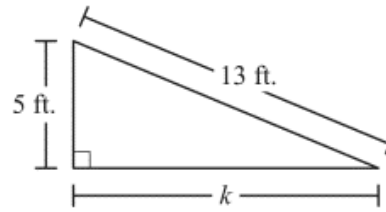
Special Right Triangles

Use the 30-60-90 and 45-45-90 triangle relationships to solve for the missing sides.

5.

6.

7.

8.

Right Triangle Trigonometry
Solve for missing sides and angles.

9.

10.

11.

12.

13.

14.
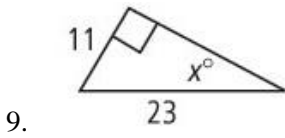
Applications

15. The Seattle Space Needle casts a 127-meter shadow. If the angle of elevation from the tip of the shadow to the top of the Space Needle is 68°, how tall is the Space Needle?
16. Suppose a 40-ft ladder is leaning against a wall. If it forms a 23° angle with the wall, how far is the ladder from the wall?
17. A ramp at the loading dock of an automobile manufacturing plant has a base of 77 meters. The length of the ramp is 215 meters. What is the angle of elevation from the base of the ramp to the top entrance to the loading dock?
18. A kid in his tree fort looks down to see the fort's shadow beneath him. If the fort is 11 feet off the ground and the angle of elevation from the sun is 12°, how long is the shadow?

6 Probability

1. A spinner is divided into 10 equal parts and numbered from 1 through 10. What is the probability of spinning a number less than 6 or even in a single spin?

2. A and B are **independent events**. $P(A) = \frac{3}{5}$ and $P(B) = \frac{5}{6}$, find $P(A \cup B)$.

3. In certain population, the probability that a men lives to at least seventy-five years long is 0.75. The probability that he will live to at least eighty-five years is 0.65. If a man is seventy-five years old, what is the conditional probability he will survive to eighty-five years?

4. Complete the two-way frequency table for the given information to answer the question.

   In a car show there are 8 blue cars, one of which is a hatchback. 6 of the 20 cars in the showroom are hatchbacks.

   a. P(not a hatchback) =

   b. P(not blue) =

   c. P(not a hatchback | blue) =

   d. P(not blue and not a hatchback) =

   e. P(blue or hatchback) =

   f. What is the probability that a car selected at random is a hatchback, given that it is not a blue car?

	Hatchback	Not a hatchback	Total
Blue	1		8
Not Blue			
Total	6		20

5. In a certain college, 25% of the boys and 10% of the girls are on scholarships. The girls constitute 60% of the student body. If a student is chosen at random, find the probability of the following.

   a. Fill in the rest of the diagram.
   b. Given that the person is a boy, find the probability that he is on a scholarship.
   c. P(boy ∩ scholarship) =
   d. P(girl ∩ not on scholarship) =
   e. P(scholarship) =
   f. P(boy) =
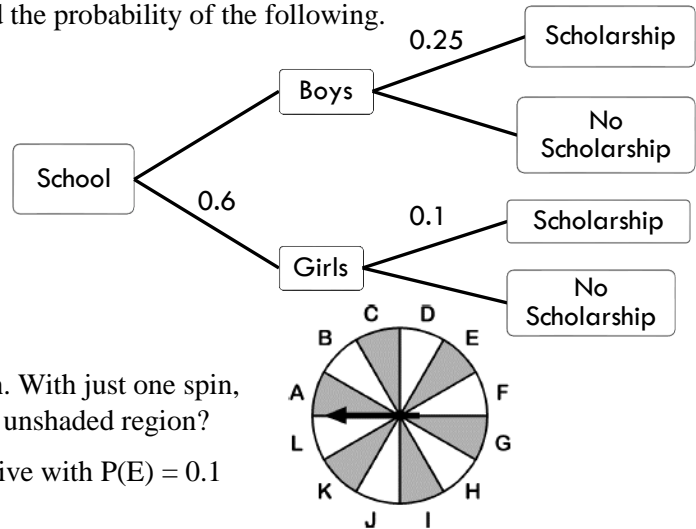
6. A spinner is divided into twelve sections, as shown. With just one spin, what is the probability of landing on a vowel or an unshaded region?

7. Let E and F be two events that are mutually exclusive with P(E) = 0.1 and P(F) = 0.6. What is the probability of P(E∪F)?

8. In a certain city, 45% of the people have brown hair, 30% have brown eyes, and 20% of the people have both brown hair and brown eyes. What is the probability that they have brown hair or brown eyes?

9. Sam rolled a number cube 10 times with the following results; {1,2,2,4,4,4,5,5,5,6}. Compare the theoretical and experimental probabilities of rolling a 4.

10. A study on the effects that listening to loud music through headphones had on teenagers' hearing found that 12% of those teenagers in the sample who did listen to music in this way showed signs of hearing problems. If 60% of the sample reported that they listened to loud music on headphones regularly, and 85% of the sample were found not to have hearing problems, are the events {having hearing problems} and {listening to loud music on headphones} independent? Explain your reasoning.