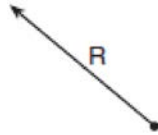


**G.SRT.D.11: Vectors**

- 1 The accompanying diagram shows a resultant force vector,  $R$ .



Which diagram best represents the pair of component force vectors,  $A$  and  $B$ , that combined to produce the resultant force vector  $R$ ?

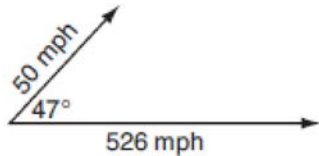
- 1) A vertical vector  $A$  pointing up and a horizontal vector  $B$  pointing left, both originating from the same point.
- 2) A horizontal vector  $A$  pointing left and a horizontal vector  $B$  pointing right, both originating from the same point.
- 3) A vertical vector  $A$  pointing up and a horizontal vector  $B$  pointing right, both originating from the same point.
- 4) A vertical vector  $A$  pointing up and a diagonal vector  $B$  pointing up and to the right, both originating from the same point.

- 2 A tractor stuck in the mud is being pulled out by two trucks. One truck applies a force of 1,200 pounds, and the other truck applies a force of 1,700 pounds. The angle between the forces applied by the two trucks is  $72^\circ$ . Find the magnitude of the resultant force, to the *nearest pound*.
- 3 Forces of 40 pounds and 70 pounds act on a body at an angle measure  $60^\circ$ . Find the magnitude of the resultant of these forces to the *nearest hundredth of a pound*.

- 4 Two equal forces act on a body at an angle of  $80^\circ$ . If the resultant force is 100 newtons, find the value of one of the two equal forces, to the *nearest hundredth of a newton*.
- 5 The measures of the angles between the resultant and two applied forces are  $65^\circ$  and  $42^\circ$ , and the magnitude of the resultant is 24 pounds. Find, to the *nearest pound*, the magnitude of the larger force.
- 6 Two forces act on a body to produce a resultant force of 70 pounds. One of the forces is 50 pounds and forms an angle of  $67^\circ 40'$  with the resultant force. Find, to the *nearest pound*, the magnitude of the other force.
- 7 The measures of the angles between the resultant and two applied forces are  $60^\circ$  and  $45^\circ$ , and the magnitude of the resultant is 27 pounds. Find, to the *nearest pound*, the magnitude of each applied force.
- 8 Two tow trucks try to pull a car out of a ditch. One tow truck applies a force of 1,500 pounds while the other truck applies a force of 2,000 pounds. The resultant force is 3,000 pounds. Find the angle between the two applied forces, rounded to the *nearest degree*.

- 9 One force of 20 pounds and one force of 15 pounds act on a body at the same point so that the resultant force is 19 pounds. Find, to the *nearest degree*, the angle between the two original forces.
- 10 Two forces of 14 and 30 act on a body forming an obtuse angle with each other. If the resultant force has a magnitude of 20, find the angle between the two forces to the *nearest degree*.
- 11 Two forces of 130 and 150 pounds yield a resultant force of 170 pounds. Find, to the *nearest ten minutes* or *nearest tenth of a degree*, the angle between the original two forces.
- 12 Two forces of 80 pounds and 100 pounds yield a resultant force of 60 pounds. Find, to the *nearest ten minutes* or the *nearest tenth of a degree*, the angle between the two forces.
- 13 Two forces of 50 pounds and 69 pounds act on a body to produce a resultant of 70 pounds. Find, to the *nearest tenth of a degree* or *nearest ten minutes*, the angle formed between the resultant and the smaller force.
- 14 Two forces of 30 pounds and 40 pounds act upon a body, forming an acute angle with each other. The angle between the resultant and the 30-pound force is  $35^{\circ}10'$ . Find, to the *nearest ten minutes*, the angle between the two given forces.
- 15 Two forces of 40 pounds and 55 pounds act on a body, forming an acute angle with each other. The angle between the resultant and the 40-pound force is  $22^{\circ}20'$ . Find, to the *nearest ten minutes*, the angle between the two given forces.
- 16 Two forces of 42 pounds and 65 pounds act on a body at an acute angle with each other. The angle between the resultant force and the 42-pound force is  $38^{\circ}$ . Find, to the *nearest degree*, the angle formed by the 42-pound and the 65-pound forces.
- 17 Two forces of 25 newtons and 85 newtons acting on a body form an angle of  $55^{\circ}$ . Find the magnitude of the resultant force, to the *nearest hundredth of a newton*. Find the measure, to the *nearest degree*, of the angle formed between the resultant and the larger force.
- 18 Two forces of 40 pounds and 20 pounds, respectively, act simultaneously on an object. The angle between the two forces is  $40^{\circ}$ . Find the magnitude of the resultant, to the *nearest tenth of a pound*. Find the measure of the angle, to the *nearest degree*, between the resultant and the larger force.

- 19 A jet is flying at a speed of 526 miles per hour. The pilot encounters turbulence due to a 50-mile-per-hour wind blowing at an angle of  $47^\circ$ , as shown in the accompanying diagram.



Find the resultant speed of the jet, to the *nearest tenth of a mile per hour*. Use this answer to find the measure of the angle between the resultant force and the wind vector, to the *nearest tenth of a degree*.

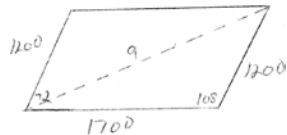
- 20 Two forces act on a body at an angle of  $100^\circ$ . The forces are 30 pounds and 40 pounds. Find the magnitude of the resultant force to the *nearest tenth of a pound*. Find the angle formed by the greater of the two forces and the resultant force to the *nearest degree*.
- 21 Two forces of 25 pounds and 38 pounds act on a body at an angle of  $74.5^\circ$ . Find, to the *nearest tenth of a pound*, the magnitude of the resultant force. Using this answer, find the angle between the resultant and the larger force to the *nearest tenth of a degree*.
- 22 Two forces of 35 pounds and 70 pounds act on a body. The angle between the two forces is  $40^\circ$ . Find the magnitude of the resultant force to the *nearest tenth of a pound*. Using this answer, determine, to the *nearest degree*, the angle between the resultant and the larger force.
- 23 Two forces act on an object. The first force has a magnitude of 85 pounds and makes an angle of  $31^\circ 30'$  with the resultant. The magnitude of the resultant is 130 pounds. Find the magnitude of the second force to the *nearest tenth of a pound*. Using this answer, find, to the *nearest ten minutes or nearest tenth of a degree*, the angle that the second force makes with the resultant.
- 24 Two forces are applied to an object. The measure of the angle between the 30.2-pound applied force and the 50.1-pound resultant is  $25^\circ$ . Find the magnitude of the second applied force to the *nearest tenth of a pound*. Using this answer, find the measure of the angle between the second applied force and the resultant to the *nearest degree*.
- 25 Gerardo and Bennie are pushing a box. Gerardo pushes with a force of 50 pounds in an easterly direction, and Bennie pushes with a force of 39 pounds in a northeasterly direction. The resultant force forms an angle of  $32^\circ$  with the 39-pound force. Find the angle between the 50-pound force and the 39-pound force, to the *nearest tenth of a degree*. Find the magnitude of the resultant force, to the *nearest pound*.
- 26 Two forces of 40 pounds and 28 pounds act on an object. The angle between the two forces is  $65^\circ$ . Find the magnitude of the resultant force, to the *nearest pound*. Using this answer, find the measure of the angle formed between the resultant and the *smaller* force, to the *nearest degree*.
- 27 Forces of 22 pounds and 43 pounds act on an object at an angle of  $52^\circ$ . Determine, to the *nearest pound*, the magnitude of the resultant force. Find, to the *nearest degree*, the angle between the smaller force and the resultant force.

**G.SRT.D.11: Vectors**

**Answer Section**

1 ANS: 1 REF: 010808b

2 ANS:



2364

REF: 011032b

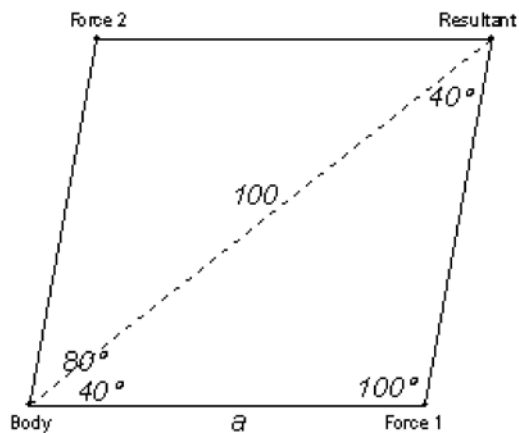
3 ANS:

96.44

REF: 069842siii

4 ANS:

65.27. Because the forces are equal, the resultant bisects the angle between the forces. Use the Law of Sines to



$$\frac{a}{\sin 40} = \frac{100}{\sin 100}$$

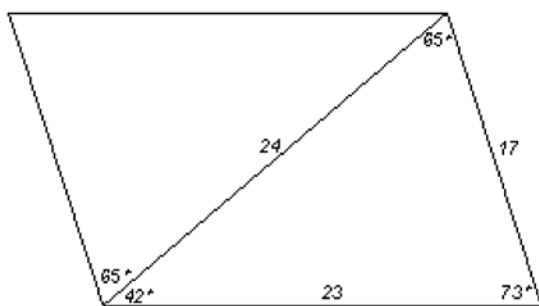
$$a = \frac{100 \sin 40}{\sin 100}$$

$$a = 65.27$$

find the magnitude of one of the forces.

REF: 060428b

5 ANS:



23.

$$\frac{24}{\sin 73} = \frac{x}{\sin 65}$$

$$x = \frac{24 \sin 65}{\sin 73}$$

$$x \approx 23$$

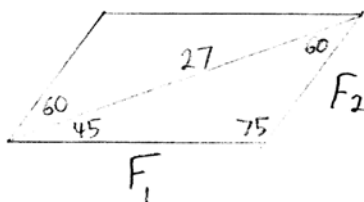
REF: 010827b

6 ANS:

69

REF: 088939siii

7 ANS:



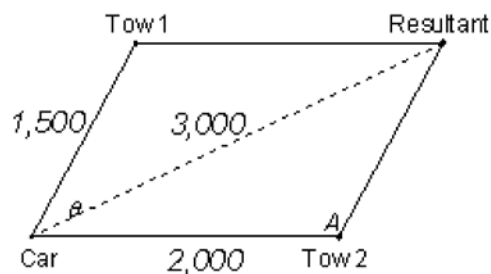
$$\frac{27}{\sin 75} = \frac{F_1}{\sin 60} \quad \frac{27}{\sin 75} = \frac{F_2}{\sin 45}$$

$$F_1 \approx 24 \quad F_2 \approx 20$$

REF: 061238a2

8 ANS:

63°. Because the resultant is greater than both forces, the angle between the forces is acute.



To find  $\theta$ , the angle between the two applied forces, find its

$$3000^2 = 1500^2 + 2000^2$$

$$- 2(1500)(2000) \cos A$$

$$9000000 = 6250000 - 6000000 \cos A$$

supplement,  $A$ , using the Law of Cosines.

$$2750000 = -6000000 \cos A$$

$$\theta = 180 - 117 = 63^\circ$$

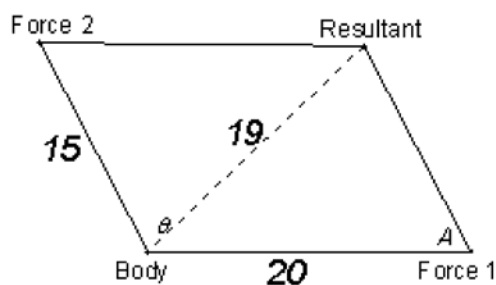
$$-\frac{2750000}{6000000} = \cos A$$

$$A = 117^\circ$$

REF: 080228b

9 ANS:

116. Because the resultant is not greater than both forces, the angle between the forces is obtuse.



To find  $\theta$ , the angle between the two applied forces, find its

$$19^2 = 15^2 + 20^2 - 2(15)(20) \cos A$$

$$361 = 625 - 600 \cos A$$

supplement,  $A$ , using the Law of Cosines.  $-264 = -600 \cos A$

$$\theta = 180 - 64 = 116^\circ$$

$$\frac{-264}{-600} = \cos A$$

$$A = 64^\circ$$

REF: 010430b

10 ANS:

146°

REF: 018738siii

11 ANS:  
105.6° or 105°40'

REF: 080042siii

12 ANS:  
143.1° or 143°10'

REF: 080239siii

13 ANS:  
67.9° or 67°50'

REF: 060041siii

14 ANS:  
60°50'

REF: 068141siii

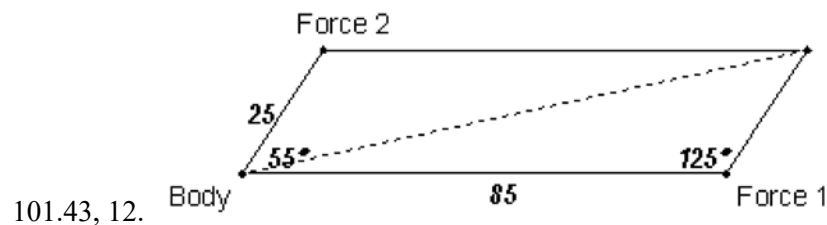
15 ANS:  
38°20'

REF: 088740siii

16 ANS:  
61

REF: 069042siii

17 ANS:



101.43, 12.

$$r^2 = 25^2 + 85^2 - 2(25)(85)\cos 125.$$

$$r^2 \approx 10287.7$$

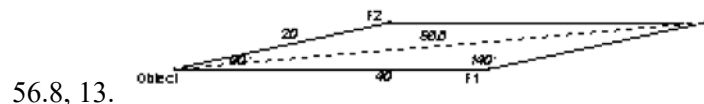
$$r \approx 101.43$$

$$\frac{2.5}{\sin x} = \frac{101.43}{\sin 125}$$

$$x \approx 12$$

REF: fall0939a2

18 ANS:



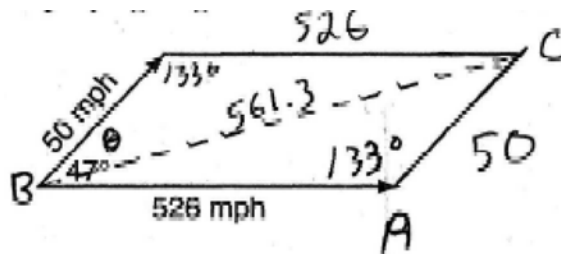
56.8, 13.

resultant.  $a^2 = 20^2 + 40^2 - 2(20)(40)\cos 140^\circ$   
 $a \approx 56.8$

Use the Law of Cosines to find the magnitude of the resultant. Use the Law of Sines to find the angle.  $\frac{20}{\sin B} = \frac{56.8}{\sin 140^\circ}$   
 $B \approx 13^\circ$

REF: 010734b

19 ANS:



561.3, 43.3.

resultant.  $a^2 = 50^2 + 526^2 - 2(50)(526)\cos 133^\circ$   
 $a \approx 561.3$

Use the Law of Cosines to find the magnitude of the resultant. Use the Law of Sines to find  $\theta$ .  $\frac{526}{\sin \theta} = \frac{561.3}{\sin 133^\circ}$   
 $\sin \theta \approx .685$   
 $\theta \approx \sin^{-1} .685$   
 $\theta \approx 43.3^\circ$

REF: 060734b

20 ANS:

45.6, 40

REF: 089640siii

21 ANS:

50.8, 28.3

REF: 060242siii

22 ANS:

99.4, 13

REF: 080337siii

23 ANS:

72.7, 37.7° or 37°40'

REF: 089740siii

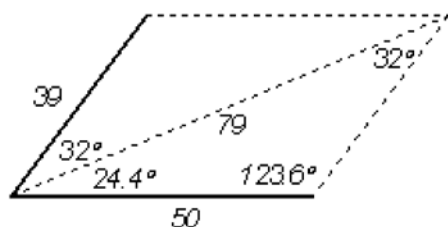
24 ANS:

26.1, 29

REF: 080137siii



25 ANS:



56.4, 79.

$$\frac{50}{\sin 32} = \frac{39}{\sin B} \quad \frac{r}{\sin 123.6} \approx \frac{50}{\sin 32}$$

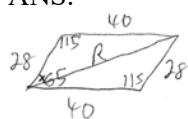
$$\sin B = \frac{39 \sin 32}{50} \quad r \approx \frac{50 \sin 123.6}{\sin 32}$$

$$B \approx 24.4 \quad r \approx 79$$

$$32 + 24.4 \approx 56.4$$

REF: 060834b

26 ANS:



$$R = \sqrt{28^2 + 40^2 - 2(28)(40) \cos 115} \approx 58 \quad \frac{58}{\sin 115} = \frac{40}{\sin x}$$

$$x \approx 39$$

REF: 061439a2

27 ANS:

$$x = \sqrt{22^2 + 43^2 - 2(22)(43) \cos 128} \approx 59 \quad \frac{\sin y}{43} = \frac{\sin 128}{59}$$

$$y = \sin^{-1} \left( \frac{43 \sin 128}{59} \right) \approx 35$$

REF: 011739a2