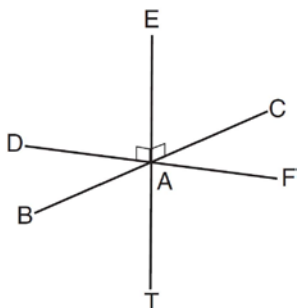


**G.CO.A.1: Planes 2**

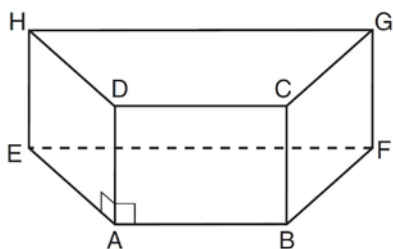
- 1 As shown in the diagram below,  $\overline{FD}$  and  $\overline{CB}$  intersect at point  $A$  and  $\overline{ET}$  is perpendicular to both  $\overline{FD}$  and  $\overline{CB}$  at  $A$ .



Which statement is *not* true?

- 1)  $\overline{ET}$  is perpendicular to plane  $BAD$ .
- 2)  $\overline{ET}$  is perpendicular to plane  $FAB$ .
- 3)  $\overline{ET}$  is perpendicular to plane  $CAD$ .
- 4)  $\overline{ET}$  is perpendicular to plane  $BAT$ .

- 2 In the prism shown below,  $\overline{AD} \perp \overline{AE}$  and  $\overline{AD} \perp \overline{AB}$ .



Which plane is perpendicular to  $\overline{AD}$ ?

- 1) HEA
- 2) BAD
- 3) EAB
- 4) EHG

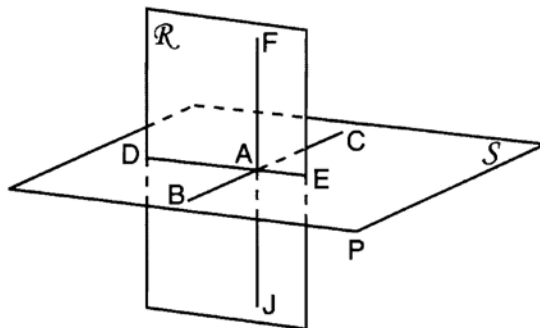
- 3 In the diagram below, point  $K$  is in plane  $\mathcal{P}$ .



How many lines can be drawn through  $K$ , perpendicular to plane  $\mathcal{P}$ ?

- 1) 1
- 2) 2
- 3) 0
- 4) an infinite number

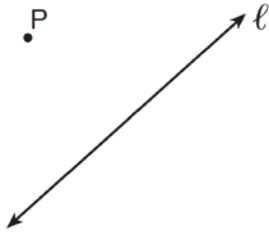
- 4 As shown in the diagram below,  $\overline{FJ}$  is contained in plane  $\mathcal{R}$ ,  $\overline{BC}$  and  $\overline{DE}$  are contained in plane  $\mathcal{S}$ , and  $\overline{FJ}$ ,  $\overline{BC}$ , and  $\overline{DE}$  intersect at  $A$ .



Which fact is sufficient to show that planes  $\mathcal{R}$  and  $\mathcal{S}$  are perpendicular?

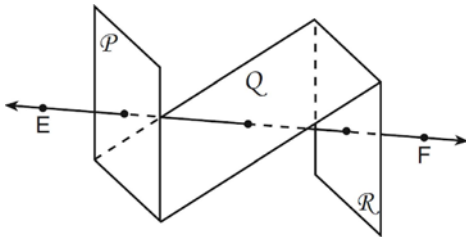
- 1)  $\overline{FA} \perp \overline{DE}$
- 2)  $\overline{AD} \perp \overline{AF}$
- 3)  $\overline{BC} \perp \overline{FJ}$
- 4)  $\overline{DE} \perp \overline{BC}$

- 5 In the diagram below, point  $P$  is not on line  $\ell$ .



How many distinct planes that contain point  $P$  are also perpendicular to line  $\ell$ ?

- 1) 1
  - 2) 2
  - 3) 0
  - 4) an infinite amount
- 6 As shown in the diagram below,  $\overleftrightarrow{EF}$  intersects planes  $\mathcal{P}$ ,  $\mathcal{Q}$ , and  $\mathcal{R}$ .



If  $\overleftrightarrow{EF}$  is perpendicular to planes  $\mathcal{P}$  and  $\mathcal{R}$ , which statement must be true?

- 1) Plane  $\mathcal{P}$  is perpendicular to plane  $\mathcal{Q}$ .
  - 2) Plane  $\mathcal{R}$  is perpendicular to plane  $\mathcal{P}$ .
  - 3) Plane  $\mathcal{P}$  is parallel to plane  $\mathcal{Q}$ .
  - 4) Plane  $\mathcal{R}$  is parallel to plane  $\mathcal{P}$ .
- 7 Point  $W$  is located in plane  $\mathcal{R}$ . How many distinct lines passing through point  $W$  are perpendicular to plane  $\mathcal{R}$ ?
- 1) one
  - 2) two
  - 3) zero
  - 4) infinite
- 8 If line  $\ell$  is perpendicular to distinct planes  $\mathcal{P}$  and  $\mathcal{Q}$ , then planes  $\mathcal{P}$  and  $\mathcal{Q}$
- 1) are parallel
  - 2) contain line  $\ell$
  - 3) are perpendicular
  - 4) intersect, but are *not* perpendicular
- 9 If distinct planes  $\mathcal{R}$  and  $\mathcal{S}$  are both perpendicular to line  $\ell$ , which statement must always be true?
- 1) Plane  $\mathcal{R}$  is parallel to plane  $\mathcal{S}$ .
  - 2) Plane  $\mathcal{R}$  is perpendicular to plane  $\mathcal{S}$ .
  - 3) Planes  $\mathcal{R}$  and  $\mathcal{S}$  and line  $\ell$  are all parallel.
  - 4) The intersection of planes  $\mathcal{R}$  and  $\mathcal{S}$  is perpendicular to line  $\ell$ .
- 10 Point  $A$  lies in plane  $\mathcal{B}$ . How many lines can be drawn perpendicular to plane  $\mathcal{B}$  through point  $A$ ?
- 1) one
  - 2) two
  - 3) zero
  - 4) infinite

- 11 Point  $A$  is on line  $m$ . How many distinct planes will be perpendicular to line  $m$  and pass through point  $A$ ?
- 1) one
  - 2) two
  - 3) zero
  - 4) infinite
- 12 Lines  $a$  and  $b$  intersect at point  $P$ . Line  $c$  passes through  $P$  and is perpendicular to the plane containing lines  $a$  and  $b$ . Which statement must be true?
- 1) Lines  $a$ ,  $b$ , and  $c$  are coplanar.
  - 2) Line  $a$  is perpendicular to line  $b$ .
  - 3) Line  $c$  is perpendicular to both line  $a$  and line  $b$ .
  - 4) Line  $c$  is perpendicular to line  $a$  or line  $b$ , but not both.
- 13 Plane  $\mathcal{A}$  and plane  $\mathcal{B}$  are two distinct planes that are both perpendicular to line  $\ell$ . Which statement about planes  $\mathcal{A}$  and  $\mathcal{B}$  is true?
- 1) Planes  $\mathcal{A}$  and  $\mathcal{B}$  have a common edge, which forms a line.
  - 2) Planes  $\mathcal{A}$  and  $\mathcal{B}$  are perpendicular to each other.
  - 3) Planes  $\mathcal{A}$  and  $\mathcal{B}$  intersect each other at exactly one point.
  - 4) Planes  $\mathcal{A}$  and  $\mathcal{B}$  are parallel to each other.
- 14 Plane  $\mathcal{P}$  is parallel to plane  $\mathcal{Q}$ . If plane  $\mathcal{P}$  is perpendicular to line  $\ell$ , then plane  $\mathcal{Q}$
- 1) contains line  $\ell$
  - 2) is parallel to line  $\ell$
  - 3) is perpendicular to line  $\ell$
  - 4) intersects, but is not perpendicular to line  $\ell$
- 15 If  $\overleftrightarrow{AB}$  is contained in plane  $\mathcal{P}$ , and  $\overleftrightarrow{AB}$  is perpendicular to plane  $\mathcal{R}$ , which statement is true?
- 1)  $\overleftrightarrow{AB}$  is parallel to plane  $\mathcal{R}$ .
  - 2) Plane  $\mathcal{P}$  is parallel to plane  $\mathcal{R}$ .
  - 3)  $\overleftrightarrow{AB}$  is perpendicular to plane  $\mathcal{P}$ .
  - 4) Plane  $\mathcal{P}$  is perpendicular to plane  $\mathcal{R}$ .
- 16 Point  $A$  lies on plane  $\mathcal{P}$ . How many distinct lines passing through point  $A$  are perpendicular to plane  $\mathcal{P}$ ?
- 1) 1
  - 2) 2
  - 3) 0
  - 4) infinite

**G.CO.A.1: Planes 2****Answer Section**

1 ANS: 4 REF: 011315ge

2 ANS: 3 REF: 061522ge

3 ANS: 1 REF: 061418ge

4 ANS: 3

As originally administered, this question read, “Which fact is *not* sufficient to show that planes  $\mathcal{R}$  and  $\mathcal{S}$  are perpendicular?” The State Education Department stated that since a correct solution was not provided for Question 11, all students shall be awarded credit for this question.

REF: 081211ge

5 ANS: 1 REF: 081514ge

6 ANS: 4 REF: 061203ge

7 ANS: 1 REF: 011512ge

8 ANS: 1 REF: 081323ge

9 ANS: 1 REF: 011404ge

10 ANS: 1 REF: 011218ge

11 ANS: 1 REF: 061310ge

12 ANS: 3 REF: 081218ge

13 ANS: 4 REF: 011306ge

14 ANS: 3 REF: 061401ge

15 ANS: 4 REF: 061213ge

16 ANS: 1 REF: 061514ge