Math League Contest Problem Set 12221
Sprint Round Problem 25

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On Monday, Travis averaged 45 miles per hour on his roundtrip journey from home to work and then back home. On Tuesday, Travis averaged 40 miles per hour on the same roundtrip journey, and his roundtrip journey took 12 minutes longer than it did on Monday. How far, in miles, is Travis' home from his work?

Problem Statement | Solution | Conclusion

Compute the distance, in miles, from Travis' home to his work.

Let d be the number of miles from Travis' home to his work.

Let d be the number of miles from Travis' home to his work.
His roundtrip journey is twice that distance, or $2 \cdot d$.

Problem Statement	Solution	Conclusion
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Compute the distance, in miles, from Travis' home to his work.

Let d be the number of miles from Travis' home to his work.

His roundtrip journey is twice that distance, or $2 \cdot d$.

Let t be the number of hours Travis' roundtrip takes on Monday.

Problem Statement   Solution   Conclusion

Compute the distance, in miles, from Travis' home to his work.

Let d be the number of miles from Travis' home to his work.
His roundtrip journey is twice that distance, or $2 \cdot d$.
Let t be the number of hours Travis' roundtrip takes on Monday.
We're given that Travis' travel rate on Monday is 45 mph.

Let d be the number of miles from Travis' home to his work.
His roundtrip journey is twice that distance, or $2 \cdot d$.
Let t be the number of hours Travis' roundtrip takes on Monday.
We're given that Travis' travel rate on Monday is 45 mph.

$$distance = rate \cdot time$$

$$2 \cdot d = 45 \cdot t \qquad (1)$$

Problem Statement | Solution | Conclusion
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Compute the distance, in miles, from Travis' home to his work.

$$distance = rate \cdot time$$

$$2 \cdot d = 45 \cdot t \qquad (1)$$

Problem Statement   Solution   Conclusion

Compute the distance, in miles, from Travis' home to his work.

$$distance = rate \cdot time$$

$$2 \cdot d = 45 \cdot t \qquad (1)$$

On Tuesday, Travis' roundtrip took an additional 12 minutes, which is $\frac{1}{5}$ of an hour.

$$distance = rate \cdot time$$

$$2 \cdot d = 45 \cdot t \tag{1}$$

On Tuesday, Travis' roundtrip took an additional 12 minutes, which is $\frac{1}{5}$ of an hour.

The number of hours Travis' roundtrip takes on Tuesday is $t + \frac{1}{5}$.

Problem Statement   Solution   Conclusion
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Compute the distance, in miles, from Travis' home to his work.

$$distance = rate \cdot time$$

$$2 \cdot d = 45 \cdot t \qquad (1)$$

On Tuesday, Travis' roundtrip took an additional 12 minutes, which is $\frac{1}{5}$ of an hour.

The number of hours Travis' roundtrip takes on Tuesday is $t + \frac{1}{5}$.

We're given that Travis' travel rate on Tuesday is 40 mph.

Problem Statement   Solution   Conclusion
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Compute the distance, in miles, from Travis' home to his work.

$$distance = rate \cdot time$$

$$2 \cdot d = 45 \cdot t \tag{1}$$

On Tuesday, Travis' roundtrip took an additional 12 minutes, which is $\frac{1}{5}$ of an hour.

The number of hours Travis' roundtrip takes on Tuesday is $t + \frac{1}{5}$.

We're given that Travis' travel rate on Tuesday is 40 mph.

$$2 \cdot d = 40 \cdot \left(t + \frac{1}{5} \right) \tag{2}$$

Problem Statement
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Solution
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Conclusion
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Compute the distance, in miles, from Travis' home to his work.

$$distance = rate \cdot time$$

$$2 \cdot d = 45 \cdot t \qquad (1)$$

On Tuesday, Travis' roundtrip took an additional 12 minutes, which is $\frac{1}{5}$ of an hour.

The number of hours Travis' roundtrip takes on Tuesday is $t + \frac{1}{5}$.

We're given that Travis' travel rate on Tuesday is 40 mph.

$$2 \cdot d = 40 \cdot t + 40 \cdot \frac{1}{5} \qquad (2)$$

Compute the distance, in miles, from Travis' home to his work.

$$distance = rate \cdot time$$

$$2 \cdot d = 45 \cdot t \tag{1}$$

On Tuesday, Travis' roundtrip took an additional 12 minutes, which is $\frac{1}{5}$ of an hour.

The number of hours Travis' roundtrip takes on Tuesday is $t + \frac{1}{5}$.

We're given that Travis' travel rate on Tuesday is 40 mph.

$$2 \cdot d = 40 \cdot t + 8 \tag{2}$$

$$distance = rate \cdot time$$

$$2 \cdot d = 45 \cdot t \tag{1}$$

$$2 \cdot d = 40 \cdot t + 8 \tag{2}$$

Problem Statement   Solution   Conclusion
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Compute the distance, in miles, from Travis' home to his work.

$$distance = rate \cdot time$$

$$2 \cdot d = 45 \cdot t \qquad (1)$$

$$2 \cdot d = 40 \cdot t + 8 \qquad (2)$$

Substituting $45 \cdot t$ for $2 \cdot d$ in (2), we have

$$distance = rate \cdot time$$

$$2 \cdot d = 45 \cdot t \tag{1}$$

$$2 \cdot d = 40 \cdot t + 8 \tag{2}$$

Substituting $45 \cdot t$ for $2 \cdot d$ in (2), we have

$$45 \cdot t = 40 \cdot t + 8.$$

Problem Statement   Solution   Conclusion

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Compute the distance, in miles, from Travis' home to his work.

$$distance = rate \cdot time$$

$$2 \cdot d = 45 \cdot t \tag{1}$$

$$2 \cdot d = 40 \cdot t + 8 \tag{2}$$

Substituting $45 \cdot t$ for $2 \cdot d$ in (2), we have

$$45 \cdot t - 40 \cdot t = 8.$$

Problem Statement   Solution   Conclusion
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Compute the distance, in miles, from Travis' home to his work.

$$distance = rate \cdot time$$

$$2 \cdot d = 45 \cdot t \qquad (1)$$

$$2 \cdot d = 40 \cdot t + 8 \qquad (2)$$

Substituting $45 \cdot t$ for $2 \cdot d$ in (2), we have

$$(45 - 40) \cdot t = 8.$$

Problem Statement | Solution | Conclusion
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Compute the distance, in miles, from Travis' home to his work.

$$distance = rate \cdot time$$

$$2 \cdot d = 45 \cdot t \qquad (1)$$

$$2 \cdot d = 40 \cdot t + 8 \qquad (2)$$

Substituting $45 \cdot t$ for $2 \cdot d$ in (2), we have

$$5 \cdot t = 8.$$

Problem Statement   Solution   Conclusion

Compute the distance, in miles, from Travis' home to his work.

$$distance = rate \cdot time$$

$$2 \cdot d = 45 \cdot t \tag{1}$$

$$2 \cdot d = 40 \cdot t + 8 \tag{2}$$

Substituting $45 \cdot t$ for $2 \cdot d$ in (2), we have

$$t = \frac{8}{5}.$$

Problem Statement   Solution   Conclusion
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Compute the distance, in miles, from Travis' home to his work.

$$distance = rate \cdot time$$

$$2 \cdot d = 45 \cdot t \tag{1}$$

$$2 \cdot d = 40 \cdot t + 8 \tag{2}$$

$$t = \frac{8}{5} \tag{3}$$

$$distance = rate \cdot time$$

$$2 \cdot d = 45 \cdot t \tag{1}$$

$$2 \cdot d = 40 \cdot t + 8 \tag{2}$$

$$t = \frac{8}{5} \tag{3}$$

Substituting $\frac{8}{5}$ for t in (1), we have

Problem Statement | Solution | Conclusion

Compute the distance, in miles, from Travis' home to his work.

$$distance = rate \cdot time$$

$$2 \cdot d = 45 \cdot t \qquad (1)$$

$$2 \cdot d = 40 \cdot t + 8 \qquad (2)$$

$$t = \frac{8}{5} \qquad (3)$$

Substituting $\frac{8}{5}$ for t in (1), we have

$$2 \cdot d = 45 \cdot \frac{8}{5}.$$

Problem Statement   Solution   Conclusion
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Compute the distance, in miles, from Travis' home to his work.

$$distance = rate \cdot time$$

$$2 \cdot d = 45 \cdot t \qquad (1)$$

$$2 \cdot d = 40 \cdot t + 8 \qquad (2)$$

$$t = \frac{8}{5} \qquad (3)$$

Substituting $\frac{8}{5}$ for t in (1), we have

$$2 \cdot d = 45 \cdot \frac{1}{5} \cdot 8.$$

$$distance = rate \cdot time$$

$$2 \cdot d = 45 \cdot t \tag{1}$$

$$2 \cdot d = 40 \cdot t + 8 \tag{2}$$

$$t = \frac{8}{5} \tag{3}$$

Substituting $\frac{8}{5}$ for t in (1), we have

$$2 \cdot d = 9 \cdot 8.$$

Problem Statement   Solution   Conclusion

Compute the distance, in miles, from Travis' home to his work.

$$distance = rate \cdot time$$

$$2 \cdot d = 45 \cdot t \tag{1}$$

$$2 \cdot d = 40 \cdot t + 8 \tag{2}$$

$$t = \frac{8}{5} \tag{3}$$

Substituting $\frac{8}{5}$ for t in (1), we have

$$2 \cdot d = 72.$$

Problem Statement   Solution   Conclusion
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Compute the distance, in miles, from Travis' home to his work.

$$distance = rate \cdot time$$

$$2 \cdot d = 45 \cdot t \tag{1}$$

$$2 \cdot d = 40 \cdot t + 8 \tag{2}$$

$$t = \frac{8}{5} \tag{3}$$

Substituting $\frac{8}{5}$ for t in (1), we have

$$d = \boxed{36}.$$

Key Concepts

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- Rates

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- Rates
- System of equations

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- Rates
- System of equations
- Substitution